GE Healthcare

Technical Publications

Direction DOC2546408 Rev 2

Universal Viewer* Version 8.0

DICOM CONFORMANCE STATEMENT

*** Trademark of General Electric Company**

Copyright© 2021 by General Electric Co.

Do not duplicate

Confidentiality and Proprietary Rights

This document is the confidential property of GE Healthcare, a division of General Electric Company (“GE Healthcare”). No part of this document may be reproduced in any form, by photostat, microfilm, xerography, or any other means, or incorporated into any information retrieval system, electronic or mechanical, without the written permission of GE Healthcare. Inquiries regarding copying and/or using the materials contained in this document outside of the limited scope described herein should be addressed to the e-mail address listed above.

GE Healthcare reminds you that there may be legal, ethical, and moral obligations for medical care providers to protect sensitive patient information when dealing with vendors such as GE Healthcare. You should obtain explicit written consent from both the patient and GE Healthcare before you disclose sensitive patient information to GE Healthcare.

Limitations and Conditions of Use

This document is the confidential property of GE Healthcare and is furnished to you, a current GE Healthcare customer, pursuant to a non-disclosure agreement (“NDA”) between you and GE Healthcare. If you are not (i) a current GE Healthcare customer, and (ii) subject to an NDA with GE Healthcare, you are not authorized to access this document.

The information contained herein is confidential and should not be used, disclosed, or duplicated for any purpose other than developing information system plans within GE Healthcare customer organizations. Duplication and/or distribution of this document beyond GE Healthcare customer organization information systems and management executives are not allowed without express written consent from GE Healthcare.

Trademarks

GE, the GE Monogram and imagination at work are trademarks of General Electric Company.

All other product names and logos are trademarks or registered trademarks of their respective companies.

Disclaimers

Any information related to clinical functionality is intended for clinical professionals. Clinical professionals are expected to know the medical procedures, practices and terminology required to monitor patients. Operation of the product should neither circumvent nor take precedence over required patient care, nor should it impede the human intervention of attending nurses, physicians or other medical personnel in a manner that would have a negative impact on patient health.

General Electric Company reserves the right to make changes in specifications and features shown herein, or discontinue the products described at any time without notice or obligation. This does not constitute a representation or warranty or documentation regarding the product or service featured. All illustrations or examples are provided for informational or reference purposes and/or as fictional examples only. Your product features and configuration may be different than those shown. Contact your GE Representative for the most current information.

GE Healthcare
500 West Monroe Street
Chicago, IL 60661 U.S.A.
www.gehealthcare.com

Revision History

Revision	Date	Description
1	30-March-2021	Initial version for Universal Viewer 8.0
2	02-July-2021	Added Section 3 Media Storage Conformance Statement

CONFORMANCE STATEMENT OVERVIEW

Table 0.1 provides an overview of the DICOM objects supported by Universal Viewer.

Note: The Universal Viewer is a viewing application that may be deployed with Enterprise Archive backend application servers. Universal Viewer does not directly use DICOM network features to communicate with any external application. However, it does display DICOM information objects from the backend application servers. It also has the ability to generate Secondary Capture images, Multi-frame True Color Secondary Capture Images, Comprehensive Structure Report, Grayscale Presentation States and Key Object Selection objects and store them in the backend application servers which manages them.

Table 0.1 Supported SOP Classes

SOP Classes	SOP Class UID	Input	Output
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	No
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	No
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	No
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	No
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	No
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multiframe True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Yes	No
Intravascular Optical Coherence Tomography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.14.1	Yes	No
Intravascular Optical Coherence Tomography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.14.2	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	No
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	No
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	No
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	No
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes	No
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Yes	No
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Encapsulated PDF	1.2.840.10008.5.1.4.1.1.104.1	Yes	No
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	No
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	No
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	No
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	No

Table 0.2 provides an overview of the Media Storage Application Profiles supported by Universal Viewer.

Table 0.2 - MEDIA SERVICES

Media Storage Application Profile	Identifier	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable			
General Purpose CD-R	STD-GEN-CD	Yes	Yes
DVD			
General Purpose DVD-RAM	STD-GEN-DVD-RAM	Yes	Yes

TABLE OF CONTENTS

1. INTRODUCTION 1

1.1 OVERVIEW 1
1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE 2
1.3 INTENDED AUDIENCE 3
1.4 SCOPE AND FIELD OF APPLICATION 3
1.5 IMPORTANT REMARKS 3
1.6 REFERENCES 4
1.7 DEFINITIONS 4
1.8 SYMBOLS AND ABBREVIATIONS 6

2. NETWORK CONFORMANCE STATEMENT 8

2.1 INTRODUCTION 8
2.2 IMPLEMENTATION MODEL 10
2.2.1 Application Data Flow Diagrams 10
2.2.2 Functional Definition of AE's 11
2.2.3 Sequencing of Real-World Activities 11
2.3 AE SPECIFICATIONS 11
2.4 COMMUNICATION PROFILES 12
2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS 12
2.5.1 Window/Level Computation 12
2.5.2 Pixel Spacing Handling 12
2.5.3 MG Modality Image Handling 14
2.5.4 Mammography 2D and DBT CAD SR Support 16
2.6 CONFIGURATION 17
2.7 SUPPORT OF EXTENDED CHARACTER SETS 17
2.8 CODES AND CONTROLLED TERMINOLOGY 18

3. MEDIA STORAGE CONFORMANCE STATEMENT 19

3.1 UNIVERSAL VIEWER DICOM MEDIA SERVER AE 19
3.2 IMPLEMENTATION MODEL 19
3.2.1 Application Data Flow 19
3.2.2 File Meta Information Options 19
3.3 AE SPECIFICATIONS 20
3.3.1 Universal Viewer Application Entity Specification 20
3.3.2 Real World Activities 20
3.3.3 Character Sets 21

4. GRAYSCALE SOFTCOPY PRESENTATION STATE IOD IMPLEMENTATION 22

4.1 MAPPING OF DICOM ENTITIES 22
4.2 IOD MODULE TABLE 22
4.3 INFORMATION MODULE DEFINITIONS 23
4.3.1 Patient Entity Modules 23
4.3.2 Study Entity Modules 24
4.3.3 Series Entity Modules 24
4.3.4 Equipment Entity Modules 24
4.3.5 Presentation State Entity Modules 25
4.4 PRIVATE DATA ATTRIBUTES 29
4.4.1 Private Group GEIIS_IW 29

4.4.2 Private Group GEIIS_RA1000 ..... *31*
4.5 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS 32
4.6 IMPORTANT REMARKS 32
4.6.1 Pixel Spacing Handling *32*
5. KEY OBJECT SELECTION IOD IMPLEMENTATION 33
5.1 INTRODUCTION 33
5.2 MAPPING OF DICOM ENTITIES 33
5.3 IOD MODULE TABLE 33
5.4 INFORMATION MODULE DEFINITIONS 34
5.4.1 Series Entity Modules *34*
5.4.2 Document Entity Modules *34*
5.5 PRIVATE DATA ATTRIBUTES 37
5.5.1 Private Group GEIIS_IW *37*

1. INTRODUCTION

1.1 OVERVIEW

This DICOM Conformance Statement is divided into Sections as described below:

Section 1 (Introduction): describes the overall structure, intent, and references for this Conformance Statement

Section 2 (Network Conformance Statement): specifies the GEHC equipment compliance to the DICOM requirements for the implementation of Networking features.

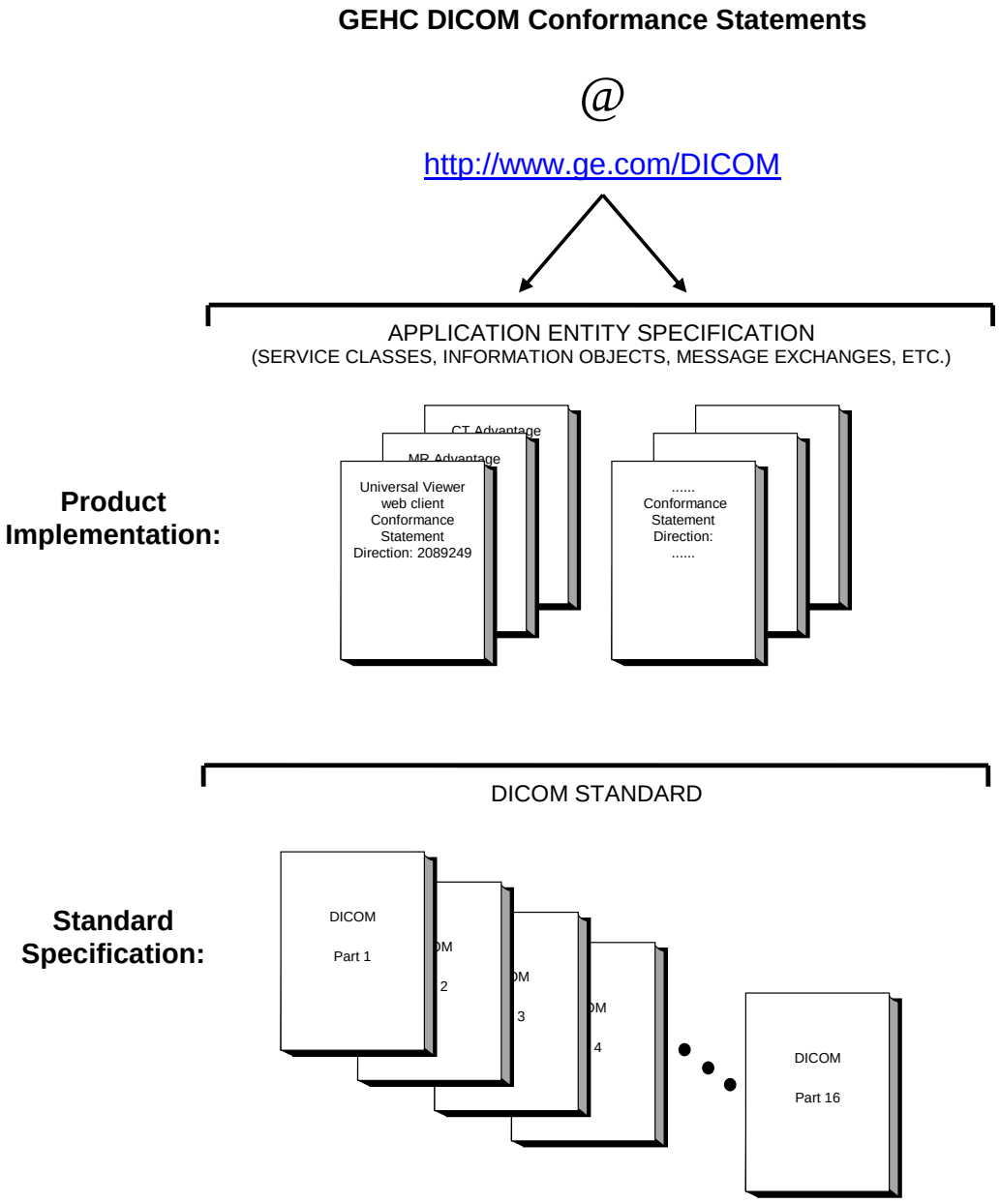
Section 3 (Media Storage Conformance Statement): specifies the GEHC equipment compliance to DICOM requirements for the implementation of Media Storage features.

Section 4 (Grayscale Presentation State IOD): specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Grayscale Presentation State Information Object.

Section 5 (Key Object Selection IOD): specifies the GEHC equipment compliance to DICOM requirements for the implementation of Key Object Selection Information Object.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEHC DICOM Conformance Statements is shown in the Illustration below.



This document specifies the DICOM implementation. It is entitled:

Universal Viewer 8.0

DICOM Conformance Statement

Direction 2089249-001

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required to interoperate with the GEHC network interface.

The GEHC Conformance Statement, contained in this document, also specifies the Lower Layer communications which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM Part 8 standard.

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at http://medical.nema.org. Comments on the Standard may be addressed to:

DICOM Secretariat
NEMA
1300 N. 17th Street, Suite 1752
Rosslyn, VA 22209
USA
Phone: +1.703.841.3200

1.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM 3.0 standard and with the terminology and concepts that are used in this standard.

1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document to provide an unambiguous specification for GEHC implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEHC medical data exchanged using DICOM. The GEHC Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEHC devices are capable of using different Information Object Definitions. For example, a GEHC CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc.

Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GEHC implementation. If the user encounters unspecified private data elements while parsing a GEHC Data Set, the user is well advised to ignore those data elements (per the DICOM standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements which are sent by GEHC devices.

1.5 IMPORTANT REMARKS

The Universal Viewer web client conforms to NEMA PS3(2011) DICOM standards.

The use of these DICOM Conformance Statements, in conjunction with the DICOM Standards, is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure**

that inter-operation will be successful. The **user (or user's agent)** needs to proceed with caution and address at least four issues:

Integration - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

Validation - Testing the complete range of possible interactions between any GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non–GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and the stability of the image data for the intended applications.

Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.

Future Evolution - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEHC protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) described by these DICOM Conformance Statements.** The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

Interaction - It is the sole responsibility of the **non–GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

NEMA PS3(2011) Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/

Enterprise Archive 4.0 DICOM Conformance Statement DOC0708777 Rev 21, available at https://www.gehealthcare.com/products/interoperability/dicom/radiology-pacs-and-ris-conformance-statements

1.7 DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – the externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between Application Entities. Example: DICOM network protocol.

Association – a network communication channel set up between Application Entities.

Attribute – a unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Information Object Definition (IOD) – the specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

Module – a set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

Service Class Provider (SCP) – role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

1.8 SYMBOLS AND ABBREVIATIONS

Term	Description
AE	Application Entity
AET	Application Entity Title
CAD	Computer Aided Detection
CD-R	Compact Disk Recordable
CR	Computerized radiography
CSE	Customer Service Engineer
CT	Computerized Tomography
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DX	Digital X-ray
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSDF	Grayscale Standard Display Function
GSPS	Grayscale Softcopy Presentation State
HIS	Hospital Information System
HL7	Health Level 7 Standard
IE	Information Entity
IHE	Integrating the Healthcare Enterprise
IO	Intra-oral X-ray
IOD	Information Object Definition
ISO	International Standards Organization
JPEG	Joint Photographic Experts Group
LUT	Look-up Table
MG	Mammography (X-ray)
MR	Magnetic Resonance
NM	Nuclear Medicine
O	Optional (Key Attribute)
OP	Ophthalmic Photography
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PET	Positron Emission Tomography
PDU	Protocol Data Unit
R	Required (Key Attribute)

Term	Description
RF	Radiofluoroscopy
RIS	Radiology Information System
RT	Radiotherapy
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SR	Structured Reporting
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
U	Unique (Key Attribute)
UL	Upper Layer
US	Ultrasound
VM	Value Multiplicity
VL	Visible Light
VR	Value Representation
XA	X-ray Angiography

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the Universal Viewer compliance to DICOM requirements for networking features.

Note: The Universal Viewer web client does not directly communicate using DICOM networking and data encoding features with external equipment.

Universal Viewer displays DICOM information objects retrieved from supported backend server application systems using proprietary communications.

Any DICOM related real world activities initiated from Universal Viewer are communicated to the backend server application where respective host services are utilized to carry out DICOM functions such as DICOM query/retrieve and DICOM send.

Note: Universal Viewer may be capable of displaying SOP classes that are not supported for storage by the respective backend server. Please refer to the DICOM Conformance Statement of the appropriate backend application server for more information.

Although the hosted backed server may support additional SOP Classes, Universal Viewer clients are only able to interpret objects that meet the conditions in the table below.

TABLE 2-1
DISPLAYABLE SOP CLASSES

SOP Class Name	SOP Class UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Intro-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Ultrasound Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Multiframe True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3
Intravascular Optical Coherence Tomography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.14.1

SOP Class Name	SOP Class UID
Intravascular Optical Coherence Tomography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.14.2
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50
Key Object Selection Storage	1.2.840.10008.5.1.4.1.1.88.59
Encapsulated PDF	1.2.840.10008.5.1.4.1.1.104.1
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3

TABLE 2-2
DISPLAYABLE PHOTOMETRIC INTERPRETATION SUPPORTED

Photometric Interpretation	(0028,0004)	The image SOP Instance must contain one of the following Photometric Interpretation values: MONOCHROME1 MONOCHROME2 RGB PALETTE COLOR YBR_FULL YBR_FULL_422

Universal Viewer is capable of generating the following SOP classes and store them in any of the supported backend servers utilizing an internal service API.

TABLE 2-3
GENERATED SOP CLASSES

SOP Class Name	SOP Class UID
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Key Object Selection Storage	1.2.840.10008.5.1.4.1.1.88.59
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33
Multiframe True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagrams

2.2.1.1 SOP INSTANCE DISPLAY

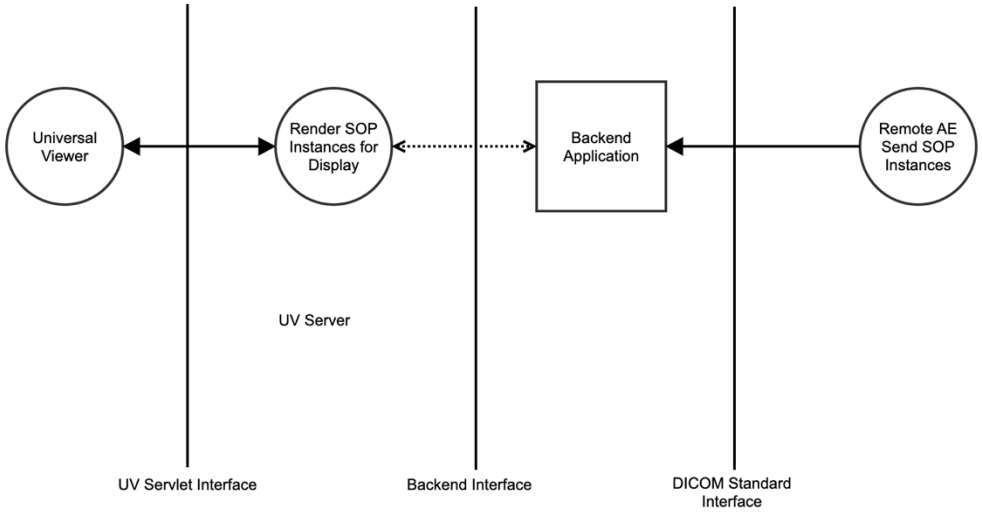
The Storage AE implements the SCP roles of the DICOM Storage SOP classes for storing DICOM Storage SOP instances.

Note: The Storage AE services are provided by their configured backend application server. As such, Universal Viewer does not directly handle DICOM network features related to Storage AE. It communicates to the backend application server using an internal service API.

Enterprise Archive backend application servers support a conceptual Storage AE that may be named differently in their conformance statements.

Please refer to the DICOM Conformance Statement of the appropriate backend application server for more information.

FIGURE 2-1
DATA FLOW DIAGRAM OF STORAGE AE FOR SOP INSTANCE DISPLAY



2.2.1.2 SEND AE FOR SOP INSTANCE TRANSFER TO REMOTE AE

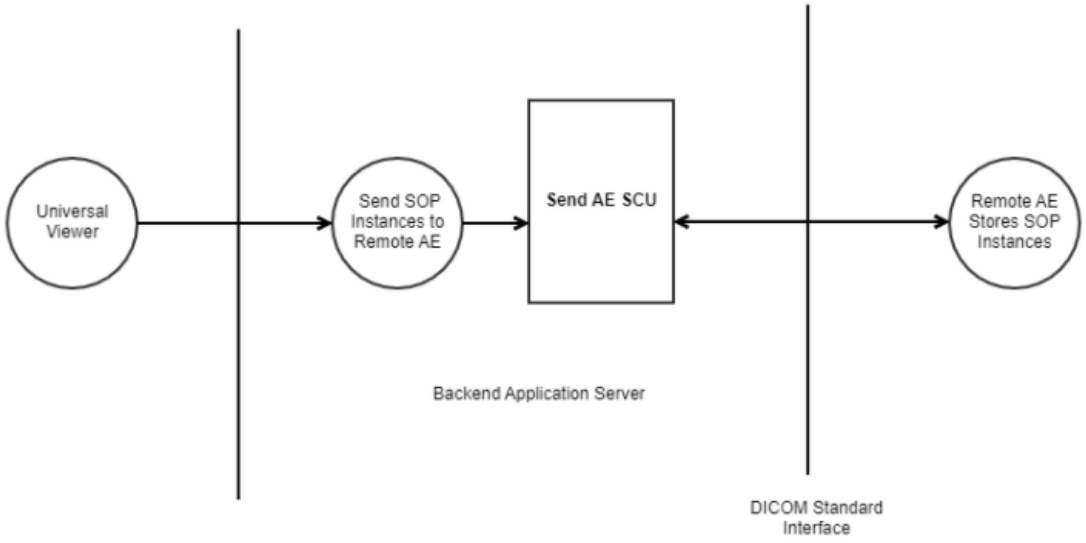
The Send AE implements the SCU roles of the DICOM Storage SOP classes for sending DICOM Storage SOP instances to a remote AE. The send services are supported at Study and Series levels.

Note: The Send AE services are provided by their configured backend application server. As such, Universal Viewer does not directly initiate DICOM network features related to Send AE. It communicates to the backend application server using an internal service API.

At this time, only the Enterprise Archive backend application servers provide the Send AE service.

Please refer to the Enterprise Archive DICOM Conformance Statement for more information.

FIGURE 2-2
DATA FLOW DIAGRAM OF SEND AE FUNCTIONALITY



2.2.2 Functional Definition of AE's

Not Applicable.

Note: Universal Viewer does not directly initiate or accept DICOM associations regardless of the backend server configuration.

Please refer to the DICOM conformance statement of the appropriate backend application server for more information.

2.2.3 Sequencing of Real-World Activities

2.2.3.1 REAL-WORLD ACTIVITY – VIEWING A DICOM OBJECT

The user may load any supported DICOM object into the Universal Viewer web client for viewing.

2.2.3.2 REAL WORLD ACTIVITY – CREATION OF GRAYSCALE PRESENTATION STATES

The user may create Grayscale Presentation States in the Universal Viewer web client and save the results in the configured backend server using direct access services.

2.2.3.3 REAL WORLD ACTIVITY – CREATION OF KEY OBJECT SELECTION

The user may create Key Object Selection documents in the Universal Viewer web client and save the results in the configured backend server using direct access services.

2.3 AE SPECIFICATIONS

Not Applicable.

Note: Universal Viewer does not directly initiate or accept DICOM associations regardless of the backend server configuration.

Please refer to the DICOM conformance statement of the appropriate backend application server for more information.

2.4 COMMUNICATION PROFILES

Not Applicable.

Note: Universal Viewer does not directly initiate or accept DICOM associations regardless of the backend server configuration.

Please refer to the DICOM conformance statement of the appropriate backend application server for more information.

2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.5.1 Window/Level Computation

It is expected that optimal Window Center and Width values are specified in the DICOM Object Objects if they have greater than 8 bits of data stored per sample. If optimal Window Center and Width values are not provided, then Universal Viewer is capable of estimating values using histogram analysis.

2.5.2 Pixel Spacing Handling

The Universal Viewer 8.0 supports use of the Pixel Spacing / Imager Pixel Spacing attributes described below for different types of images to calculate and display geometric measurement results in images. The user is strongly advised to verify the logic below is compatible with the Pixel Spacing / Imager Pixel Spacing / ERMF information provided by the modalities used at their site.

If a presentation state (GSPS) is applied to the image display and Presentation Pixel Spacing (0070,0101) is present, then that information is used. If not present, then information from the image header is used as described below.

For US images, information from Sequence of Ultrasound Regions (0018,6011) is used.

For modalities not listed below, Pixel Spacing (0028,0030) is used if only Pixel Spacing is available; or when Pixel Spacing (0028,0030) is different from Imager Pixel Spacing (0018,1164) if both are available.

When displaying CR (SOP Class 1.2.840.10008.5.1.4.1.1.1), DX (SOP Class 1.2.840.10008.5.1.4.1.1.1.1 or 1.2.840.10008.5.1.4.1.1.1.1.1), XA (SOP Class 1.2.840.10008.5.1.4.1.1.12.1 or 1.2.840.10008.5.1.4.1.1.12.3), or RF (SOP Class 1.2.840.10008.5.1.4.1.1.12.2) images, the following table applies:

Table 2-4
Pixel Spacing (0028,0030) / Imager Pixel Spacing (0018,1164) / ERMF (0018,1114) attributes

DICOM Attributes	Attributes existed in Header		Geometric Measurement for CR / DX image	Geometric Measurement for XA / RF
	YES	NO		
Pixel Spacing (0028,0030)	X			
Imager Pixel Spacing (0018,1164)		X		
ERMF (0018,1114)		X	in unit (Cm)	in unit (Cm)
Pixel Spacing (0028,0030)		X		
Imager Pixel Spacing (0018,1164)	X			
ERMF (0018,1114)		X	in unit (Cm)	pixels
Pixel Spacing (0028,0030)	X		if PS = IPS, then in unit (Cm) If PS ≠ IPS, then in unit (Cm) using PS	if PS = IPS, then pixels If PS ≠ IPS, then in unit (Cm) using PS
Imager Pixel Spacing (0018,1164)	X			
ERMF (0018,1114)		X		
Pixel Spacing (0028,0030)		X		
Imager Pixel Spacing (0018,1164)		X		
ERMF (0018,1114)		X	pixels	pixels
Pixel Spacing (0028,0030)	X			
Imager Pixel Spacing (0018,1164)		X		
ERMF (0018,1114)	X		in unit (Cm) using PS	in unit (Cm) using PS
Pixel Spacing (0028,0030)		X		
Imager Pixel Spacing (0018,1164)	X			
ERMF (0018,1114)	X		in unit (Cm) using IPS/ERMF	in unit (Cm) using IPS/ERMF
Pixel Spacing (0028,0030)	X		if PS = IPS, then in unit (Cm) using IPS/ERMF If PS ≠ IPS, then in unit (Cm) using PS	if PS = IPS, then in unit (Cm) using IPS/ERMF If PS ≠ IPS, then in unit (Cm) using PS
Imager Pixel Spacing (0018,1164)	X			
ERMF (0018,1114)	X			

When displaying MG images stored on a Enterprise Archive and the SOP Class UID (0008,0016) is *Breast Tomosynthesis Image Storage* (1.2.840.10008.5.1.4.1.1.13.1.3) the following table applies:

Table 2-5
Pixel Spacing (0028,0030) attribute from the Pixel Measures Sequence (0028,9110) for *Breast Tomosynthesis Image Storage*

DICOM Attribute	Attribute Present	Geometric Measurement
Pixel Spacing (0028,0030)	NO	Pixels
Pixel Spacing (0028,0030)	YES	in unit (Cm)

When displaying MG images stored on a Enterprise Archive and the SOP Class UID (0008,0016) is *Digital Mammography X-Ray Image Storage - For Presentation* (1.2.840.10008.5.1.4.1.1.1.2) the following table applies:

Table 2-6
Imager Pixel Spacing (0018,1164) / ERMF (0018,1114) attributes for *Digital Mammography X-Ray Image Storage - For Presentation*

DICOM Attribute	Attribute Present	Geometric Measurement
Imager Pixel Spacing (0018,1164)	NO	Pixels
ERMF (0018,1114)	NO	Pixels
Imager Pixel Spacing (0018,1164)	YES	in unit (Cm)
ERMF (0018,1114)	YES	

2.5.3 MG Modality Image Handling

The Universal Viewer supports use of the following DICOM attributes when displaying MG modality images stored Enterprise Archive backend application servers.

Table 2-7
DICOM Attributes Used for MG Modality Images

Attribute Name	Tag	Type	Use
SOP Class UID	(0008,0016)	1	
Estimated Radiographic Magnification Factor	(0018,1114)	1	Display measurements in centimeters when SOP Class UID (0008,0016) is *Digital Mammography X-Ray Image Storage - For Presentation* (1.2.840.10008.5.1.4.1.1.1.2).
Imager Pixel Spacing	(0018,1164)	1	Display measurements in centimeters when SOP Class UID (0008,0016) is *Digital Mammography X-Ray Image Storage - For Presentation* (1.2.840.10008.5.1.4.1.1.1.2).
View Position	(0018,5101)	3	If view code information is not available to ACR MQCM 1999 equivalent view name, view position text is displayed.
Image Laterality	(0020,0062)	1	Display laterality for non-cleavage views when Frame Laterality in Shared Functional Groups Sequence is not available in image header.
Laterality	(0020,0060)	2C	Display laterality for non-cleavage views when Frame Laterality in Shared Functional Groups Sequence and Image

			Laterality are both missing in image header.
Patient Orientation	(0020,0020)	2C	Obtain chest wall and axilla location for auto-flip and auto-pan MG image.
Image Orientation (Patient)	(0020,0037)	2C	Obtain chest wall and axilla location for auto-flip and auto-pan MG images.
Photometric Interpretation	(0028,0004)	1	MONOCHROME1 or MONOCHROME2 supported.
Pixel Representation	(0028,0103)	1	Unsigned pixels supported.
Pixel Padding Value	(0028,0120)	1C	Obtain input for Background Air Suppression and Fit to Screen.
Pixel Padding Range Limit	(0028,0121)	1C	Obtain input for Background Air Suppression and Fit to Screen.
Window Center	(0028,1050)	1	Default initial window center WC.
Window Width	(0028,1051)	1	Default initial window width WW.
VOI LUT Function	(0028,1056)	3	When the value of VOI LUT Function (0028,1056) is SIGMOID, the window center WC and window width WW values are used to compute a Sigmoid VOI LUT function.
View Code Sequence	(0054,0220)	1	Display ACR MQCM 1999 equivalent view name.
> Code Value	(0008,0100)	1	Used.
> Coding Scheme Designator	(0008,0102)	1	Used.
>View Modifier Code Sequence	(0054,0222)	2	Display ACR MQCM 1999 equivalent view name.
>> Code Value	(0008,0100)	1	Used.
>> Coding Scheme Designator	(0008,0102)	1	Used.
Shared Functional Groups Sequence	(5200,9229)	1	
>Plane Orientation Sequence	(0020,9116)	1	
>>Image Orientation (Patient)	(0020,0037)	1C	Obtain chest wall and axilla location for auto-flip and auto-pan MG images, and for use with breast localizer.
>Patient Orientation in Frame Sequence	(0020,9450)	1	
>>Patient Orientation	(0020,0020)	1	Obtain chest wall and axilla location for auto-flip and auto-pan MG images.
>Frame Anatomy Sequence	(0020,9071)	1	
>>Frame Laterality	(0020,9072)	1	Display laterality for non-cleavage views.
>Pixel Measures Sequence	(0028,9110)	1	
>>Slice Thickness	(0018,0050)	1C	Obtain thickness for breast localizer.
>>Pixel Spacing	(0028,0030))	1	Display measurements in centimeters when SOP Class UID (0008,0016) is *Breast Tomosynthesis Image Storage (1.2.840.10008.5.1.4.1.1.13.1.3)*
>Frame VOI LUT Sequence	(0028,9132)	1	
>>Window Center	(0028,1050)	1	Default initial window center WC.
>>Window Width	(0028,1051)	1	Default initial window width WW.
>>VOI LUT Function	(0028,1056)	3	When the value of VOI LUT Function (0028,1056) is SIGMOID, the window center WC and window width WW values are used to compute a Sigmoid VOI LUT function.
Per-frame Functional Groups Sequence	(5200,9230)	1	
>Pixel Measures Sequence	(0028,9110)	1	
>>Slice Thickness	(0018,0050)	1C	Obtain thickness for breast localizer.
>>Pixel Spacing	(0028,0030))	1	Display measurements in centimeters when SOP Class UID (0008,0016) is

			Breast Tomosynthesis Image Storage (1.2.840.10008.5.1.4.1.1.13.1.3)
>Plane Position Sequence	(0020,9113)	1	
>>Image Position (Patient)	(0020,0032)	1C	Obtain location for breast localizer.

2.5.4 Mammography 2D and DBT CAD SR Support

The Universal Viewer supports the display of content from Mammography CAD SR objects (1.2.840.10008.5.1.4.1.1.88.50) with both Digital Mammography X-Ray Image Storage - For Presentation (1.2.840.10008.5.1.4.1.1.1.2) and Breast Tomosynthesis Image Storage (1.2.840.10008.5.1.4.1.1.13.1.3) images.

The following table highlights some of the DICOM attributes that Universal Viewer uses from Mammography CAD SR objects:

Table 2-8

DICOM Attributes Used for Mammography CAD SR Objects

Attribute Name	Tag	Type	Use
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.88.50
Content Date Content Time	(0008,0023) (0008,0033)	1	Displayed in CAD summary on image and used when selecting between multiple CAD SR objects available for an image.
Manufacturer	(0008,0070)	2	Displayed in CAD summary on image.
Software Version(s)	(0018,1020)	3	1st value displayed in CAD summary on image.
Mammography CAD Document Root	TID 4000	M	
CAD Image Library	TID 4020	M	
CAD Detections Performed Successful Detections CAD Detection Performed Algorithm Identification Failed Detections CAD Detection Performed Algorithm Identification	TID 4015 TID 4017 TID 4019	MC M M	Algorithm Name and Algorithm Version displayed in CAD summary on image, and failed detections are flagged.
Overall Impression/Recommendation Mammography CAD Impression Individual Impression/Recommendation Composite Feature Single Image Finding	TID 4001 TID 2002 TID 4003 TID 4004 TID 4006	M U MC MC MC	Display Impression Description and Certainty of Impression. Only CAD Operating Point of zero is supported (findings with Rendering Intent of Presentation Required).
Mammography CAD Geometry Center Outline	TID 4021	MC M U	Outline of types POLYLINE, CIRCLE, and ELLIPSE supported. Center is not used unless Outline is not present, and then a default shape is created around the Center and displayed instead.

The following table highlights some of the DICOM attributes that Universal Viewer uses from MG images when displaying content from Mammography CAD SR objects:

Table 2-9

MG Image DICOM Attributes Used with Mammography CAD SR Objects

Attribute Name	Tag	Type	Use
Source Image Sequence > Referenced SOP Instance UID > Spatial Locations Preserved	(0008,2112) > (0008,1155) > (0028,135A)	1C 1C 3	Referenced SOP Instance UID used for matching when CAD was performed on the For Processing image that the For Presentation image was derived from. If

			Spatial Locations Preserved is present it must have a value of YES.

2.6 CONFIGURATION

Not Applicable.

Note: Universal Viewer does not directly initiate or accept DICOM associations regardless of the backend server configuration.

Please refer to the DICOM conformance statement of the appropriate backend application server for more information.

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The Universal Viewer is configurable with a single single-byte or multi-byte extended character set, depending on the language selected during installation of the system. The following extended Character Sets are supported:

TABLE 2-8
Extended Character Set Support

Encoding	DICOM Term in Specific Character Set (0008,0005)	Supported Languages
ASCII	Attribute is not present (ISO IR-6)	English
Latin-1	ISO IR-100	English, Faeroese, Finnish, French, German, Italian, Portuguese, Spanish,
Latin-2	ISO IR-101	English, Polish, Hungarian.
Latin/Cyrillic	ISO IR-144	English, Russian
Latin/Hebrew	ISO IR-138	English, Hebrew
JIS X 0201	ISO IR-13	English, Japanese (in Katakana alphabet). Limited use as Japanese encoding does not support hieroglyphic alphabet
JIS X 0208	ISO 2022 IR-87	English, Japanese Kanji (hieroglyphic) – uses escape sequences to switch between ASCII (single byte) and Japanese (two-byte per character)
KS X 1001	ISO 2022 IR-149	English, Korean – uses escape sequences to switch between ASCII (single byte) and Korean (two-byte per character)
GB18030	GB18030	English, Simplified Chinese

While the backend servers may support additional character sets, the Universal Viewer will display in the user interface only characters specified as within ISO IR-6 (ASCII) or the configured extended character set.

The user interface will allow the user to enter characters from the console keyboard that are within ASCII or the configured extended character set.

Whether character sets are displayed correctly depends on the characteristics of the backend system, the validity of the DICOM header contents, and the presence of appropriate fonts on the client system.

2.8 CODES AND CONTROLLED TERMINOLOGY

The product uses no coded terminology. Universal Viewer does not directly parse DICOM SOP instances regardless of the backend server configuration. Please refer to the DICOM conformance statement of the appropriate backend application server for more information.

3. MEDIA STORAGE CONFORMANCE STATEMENT

3.1 UNIVERSAL VIEWER DICOM MEDIA SERVER AE

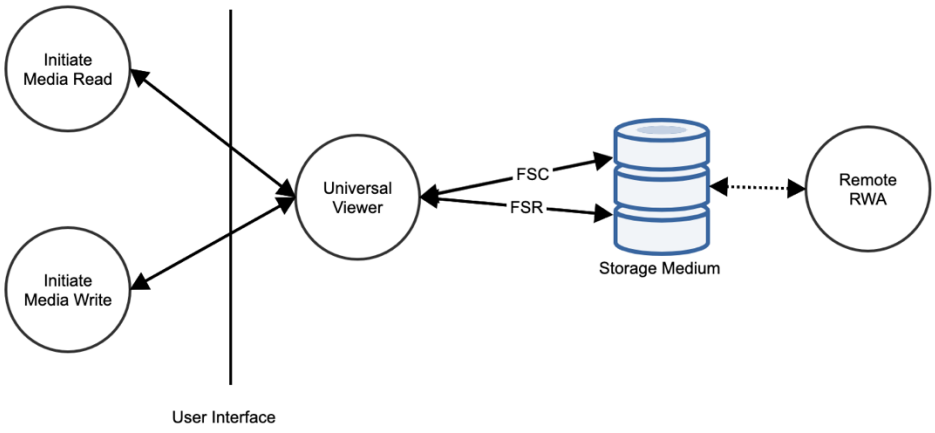
Universal Viewer provides standard conformance to the DICOM Media Storage Service and File Format (PS 3.10) and the Media Storage Application Profiles (PS 3.11).

3.2 IMPLEMENTATION MODEL

3.2.1 Application Data Flow

In addition to the Storage SOP Class support for networking, the Universal Viewer front-end application supports the Media Storage Service Class for the Interchange of images as a File Set Reader (FSR) and File Set Creator (FSC). For Digital Hardcopy the Database Service supports the Media Storage Service Class for the Interchange of images as a File Set Creator (FSC).

FIGURE 3-2
MEDIA STORAGE AE



The Universal Viewer Media Server application flow consists of the following items:

- The Universal Viewer front-end application serves both as a FSC and a FSR. In this role it is able to read directory information from the storage medium, to import images from the storage medium and to write images and directory information to the storage medium.
- The two Real World Activities involved are available through the Universal Viewer user interface.

Universal Viewer does not support writing of multi session CD-R disks.

3.2.2 File Meta Information Options

The Implementation Class UID is 1.2.840.113619.6.366

3.3 AE SPECIFICATIONS

3.3.1 Universal Viewer Application Entity Specification

Universal Viewer supports the following Standard Application Profiles, defined in DICOM 3.11 Annex A - E:

Supported Application Profile	
Description	**Identifier**
General Purpose CD-R Image Interchange profile	STD-GEN-CD
General Purpose DVD-RAM Image Interchange profile	STD-GEN-DVD-RAM

3.3.2 Real World Activities

Universal Viewer supports the following Real-World Activities within the profile mentioned above:

Real world Activities and Roles			
Supported Application Profiles	**Real World Activity**	**Role**	**SC Option**
STD-GEN-CD STD-GEN-DVD-RAM	Read image(s) from interchange media	FSR	Interchange
	Write image(s) to interchange media	FSC	Interchange

3.3.2.1 REAL WORLD ACTIVITY READ IMAGES FROM INTERCHANGE MEDIA

Universal Viewer will act as a FSR when reading all/selected objects from the interchange medium. This feature will be available through the Import command or the View command from the Remote View area.

Universal Viewer reads DICOM information objects and stores on supported backend server application systems using proprietary communications.

Note: Refer section 2.1 for the list of supported backend applications.

Universal Viewer can read all SOP classes that are supported for storage by the respective backend server. Please refer to the DICOM Conformance Statement of the appropriate backend application server for more information.

Importing of studies from a DICOM Part 10 Volume is a standard feature of Universal Viewer.

3.3.2.2 REAL WORLD ACTIVITY: WRITE IMAGES

Universal Viewer will act as a FSC when writing all or selected patients, studies or series from the local database view to interchange media.

Universal Viewer writes DICOM information objects retrieved from supported backend server application systems using proprietary communications.

Note: Refer section 2.1 for the list of supported backend applications.

Universal Viewer is capable of writing all SOP classes that are supported for storage by the respective backend server. Please refer to the DICOM Conformance Statement of the appropriate backend application server for more information.

Writing studies to a DICOM Part 10 Volume is a standard feature of Universal Viewer.

3.3.3 Character Sets

Universal Viewer may change the value of the tag (0008,0005) Character Set on incoming studies before they are written to a DICOM Part 10 Medium. This will only happen if a user operation or automatic merge operation will change an existing IOD. This may lead to multivalued Character Set values in cases where multiple non-ASCII scripts are used within the same

IOD. In case the IODs contents haven't changed, the value for the Character Set (0008,0005) is retained and therefore depends on the system that created the DICOM IOD

4. GRAYSCALE SOFTCOPY PRESENTATION STATE IOD IMPLEMENTATION

This section specifies the use of the DICOM Grayscale Softcopy Presentation State IOD to represent the information included in GSPSs produced by the Universal Viewer implementation. Corresponding attributes are conveyed using the module construct.

Universal Viewer can create Grayscale Presentation State SOP Instances explicitly or they may be created when a user selects to export the internal presentation state of a study, or internal print pages (sets of key images). One or more objects may be created to represent content of the internal presentation state. If more than one GSPS object is created, all of them are created with the same values of Presentation Label, Description, Author, Creation Date and Time.

The Presentation Label and Description are entered by the user at the time of the export of the presentation state. If GSPS objects are created as part of the export the key image set, the Label and description are set automatically.

The product supports calibration of the monitors used for user creation of presentation states to the Grayscale Display Function Standard of DICOM. The monitors shall be calibrated according to their manufacturers' recommendations and instructions.

4.1 MAPPING OF DICOM ENTITIES

Universal Viewer maps DICOM Information Entities to local information entities in the product's database and user interface.

Table 4-1
Mapping of DICOM Entities to Local Entities

DICOM IE	Local Entity
Patient	Patient
Study	Study
Series	Series
Presentation State	Presentation State

4.2 IOD MODULE TABLE

The Grayscale Softcopy Presentation State Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 4.5.

Table 4-2
GSPS IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	4.3.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	4.3.2.1
	Patient Study	Not Used	
	Clinical Trial Study	Not Used	
Series	General Series	Used	4.3.3.1
	Clinical Trial Series	Not Used	
	Presentation Series	Used	4.3.3.2
Equipment	General Equipment	Used	4.3.4.1
Presentation State	Presentation State Identification	Used	4.3.5.1
	Presentation State Relationship	Used	4.3.5.2

Entity Name	Module Name	Usage	Reference
	Presentation State Shutter	Used	4.3.5.3
	Presentation State Mask	Used	4.3.5.4
	Mask	Not Used	
	Display Shutter	Not Used	
	Bitmap Display Shutter	Not Used	
	Overlay Plane	Not used	
	Overlay Activation	Not used	
	Displayed Area	Used	4.3.5.5
	Graphic Annotation	Used when measurements or graphic/text labels are present	4.3.5.6
	Spatial Transformation	Used when Image is zoomed/rotated	4.3.5.7
	Graphic Layer	Used	4.3.5.8
	Modality LUT	Used if referenced image includes Modality LUT	4.3.5.9
	Softcopy VOI LUT	Used	4.3.5.10
	Softcopy Presentation LUT	Used	4.3.5.11
	SOP Common	Used	4.3.5.12

4.3 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the GSPS Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from when generating the instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that attributes not present in tables are not supported.

4.3.1 Patient Entity Modules

4.3.1.1 PATIENT MODULE

Table 4-3
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Taken from the images of the study
Patient ID	(0010,0020)	2	Taken from images of the study
Issuer of Patient ID	(0010,0021)	3	Not Used
Patient's Birth Date	(0010,0030)	2	Taken from images of the study
Patient's Sex	(0010,0040)	2	Taken from images of the study
Referenced Patient Sequence	(0008,1120)	3	Not Used
Patient's Birth Time	(0010,0032)	3	Not Used
Other Patient IDs	(0010,1000)	3	Not Used
Other Patient IDs Sequence	(0010,1002)	3	Not Used
Other Patient Names	(0010,1001)	3	Not Used
Ethnic Group	(0010,2160)	3	Not Used
Patient Comments	(0010,4000)	3	Not Used

4.3.2 Study Entity Modules

4.3.2.1 General Study Module

Table 4-4
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Taken from images of the study
Study Date	(0008,0020)	2	Taken from Images of the study
Study Time	(0008,0030)	2	Taken from Images of the study
Referring Physician's Name	(0008,0090)	2	Always empty
Referring Physician Identification Sequence	(0008,0096)	3	Not Used
Study ID	(0020,0010)	2	Taken from Images of the Study
Accession Number	(0008,0050)	2	Taken from Images of the Study
Study Description	(0008,1030)	3	Taken from Images of the Study

4.3.3 Series Entity Modules

4.3.3.1 General Series Module

Table 4-5
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Value = PR
Series Instance UID	(0020,000E)	1	New value is assigned for the set of GSPS objects created at the same time
Series Number	(0020,0011)	2	Always 1
Laterality	(0020,0060)	2C	Not Used
Series Date	(0008,0021)	3	Date of series creation
Series Time	(0008,0031)	3	Time of series creation

4.3.3.2 Presentation Series Module

Table 4-6
PRESENTATION SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Modality	(0008,0060)	1	Value = PR

4.3.4 Equipment Entity Modules

4.3.4.1 General Equipment Module

Table 4-7
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Value = GE Healthcare IT Radiology
Institution Name	(0008,0080)	3	Not Used
Institution Address	(0008,0081)	3	Not Used
Station Name	(0008,1010)	3	Value = name of workstation computer
Institutional Department Name	(0008,1040)	3	Not Used
Manufacturer's Model Name	(0008,1090)	3	Not Used
Device Serial Number	(0018,1000)	3	Not Used
Software Versions	(0018,1020)	3	Not Used

Attribute Name	Tag	Type	Attribute Description
Gantry ID	(0018,1008)	3	Not Used
Spatial Resolution	(0018,1050)	3	Not Used
Date of Last Calibration	(0018,1200)	3	Not Used
Time of Last Calibration	(0018,1201)	3	Not Used
Pixel Padding Value	(0028,0120)	1C	Not Used

4.3.5 Presentation State Entity Modules

4.3.5.1 Presentation State Identification Module

Table 4-8
PRESENTATION STATE IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Presentation Creation Date	(0070,0082)	1	Date of instance creation
Presentation Creation Time	(0070,0083)	1	Time of instance creation
Instance Number	(0020,0013)	1	Always 1
Content Label	(0070,0080)	1	Entered by user or generated automatically
Content Description	(0070,0081)	2	Generated automatically
Content Creator's Name	(0070,0084)	2	Name of the user who created Presentation State
Content Creator's Identification Code Sequence	(0070,0086)	3	Not Used

4.3.5.2 Presentation State Relationship Module

Table 4-9
PRESENTATION STATE RELATIONSHIP MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Referenced Series Sequence	(0008,1115)	1	
>Series Instance UID	(0020,000E)	1	
>Referenced Image Sequence	(0008,1140)	1	
>>Referenced SOP Class UID	(0008,1150)	1	
>>Referenced SOP Instance UID	(0008,1155)	1	
>>Referenced Frame Number	(0008,1160)	1C	Used if Presentation State related to the frame of multi-frame image
>>Referenced Segment Number	(0062,000B)	1C	Not Used

4.3.5.3 Presentation State Shutter Module

Table 4-10
PRESENTATION STATE SHUTTER MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Shutter Presentation Value	(0018,1622)	1C	Not Used
Shutter Presentation Color CIELab Value	(0018,1624)	1C	Not Used

4.3.5.4 Presentation State Mask Module

Table 4-11
PRESENTATION STATE MASK MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Mask Subtraction Sequence	(0028,6100)	1C	Not Used

>Mask Operation	(0028,6101)	1	
>Contrast Frame Averaging	(0028,6112)	1C	Not Used
Recommended Viewing Mode	(0028,1090)	1C	Not Used

4.3.5.5 DISPLAYED AREA MODULE

Table 4-12
DISPLAYED AREA MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Displayed Area Selection Sequence	(0070,005A)	1	
>Referenced Image Sequence	(0008,1140)	1C	Used
>>Referenced SOP Class UID	(0008,1150)	1	
>>Referenced SOP Instance UID	(0008,1155)	1	
>>Referenced Frame Number	(0008,1160)	1C	Used if applied to subset of frames of multi-frame image
>>Referenced Segment Number	(0062,000B)	1C	Not Used
>Displayed Area Top Left Hand Corner	(0070,0052)	1	
>Displayed Area Bottom Right Hand Corner	(0070,0053)	1	
>Presentation Size Mode	(0070,0100)	1	Enumerated Values used: SCALE TO FIT TRUE SIZE MAGNIFY
>Presentation Pixel Spacing	(0070,0101)	1C	Used
>Presentation Pixel Aspect Ratio	(0070,0102)	1C	Used
>Presentation Pixel Magnification Ratio	(0070,0103)	1C	Used if Presentation Size Mode is MAGNIFY

4.3.5.6 GRAPHIC ANNOTATION MODULE

Table 4-13
GRAPHIC ANNOTATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Graphic Annotation Sequence	(0070,0001)	1	
>Referenced Image Sequence	(0008,1140)	1C	Used
>>Referenced SOP Class UID	(0008,1150)	1	
>>Referenced SOP Instance UID	(0008,1155)	1	
>>Referenced Frame Number	(0008,1160)	1C	Used if annotation is applied to subset of frames of multi-frame image
>>Referenced Segment Number	(0062,000B)	1C	Not Used
>Graphic Layer	(0070,0002)	1	
>Text Object Sequence	(0070,0008)	1C	
>>Bounding Box Annotation Units	(0070,0003)	1C	Enumerated Values used: PIXEL
>>Anchor Point Annotation Units	(0070,0004)	1C	Enumerated Values used: PIXEL
>>Unformatted Text Value	(0070,0006)	1	
>>Bounding Box Top Left Hand Corner	(0070,0010)	1C	Used
>>Bounding Box Bottom Right Hand Corner	(0070,0011)	1C	Used
>>Bounding Box Text Horizontal Justification	(0070,0012)	1C	Enumerated Values used: CENTER
>>Anchor Point	(0070,0014)	1C	Used
>>Anchor Point Visibility	(0070,0015)	1C	Not Used
>Graphic Object Sequence	(0070,0009)	1C	Used
>>Graphic Annotation Units	(0070,0005)	1	Enumerated Values used: PIXEL

Attribute Name	Tag	Type	Use
>>Graphic Dimensions	(0070,0020)	1	
>>Number of Graphic Points	(0070,0021)	1	
>> Graphic Data	(0070,0022)	1	
>>Graphic Type	(0070,0023)	1	Enumerated Values used: POINT POLYLINE CIRCLE ELLIPSE
>>Graphic Filled	(0070,0024)	1C	Enumerated Values used: N = no

4.3.5.7 SPATIAL TRANSFORMATION MODULE

Table 4-14
SPATIAL TRANSFORMATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Image Rotation	(0070,0042)	1	Enumerated Values used: 0 90 180 270
Image Horizontal Flip	(0070,0041)	1	Enumerated Values used: Y = yes N = no

4.3.5.8 GRAPHIC LAYER MODULE

Table 4-15
GRAPHIC LAYER MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Graphic Layer Sequence	(0070,0060)	1	
>Graphic Layer	(0070,0002)	1	
>Graphic Layer Order	(0070,0062)	1	
>Graphic Layer Recommended Display Grayscale Value	(0070,0066)	3	Not Used
>Graphic Layer Recommended Display RGB Value	(0070,0067)	3	Not Used
>Graphic Layer Recommended Display CIELab Value	(0070,0401)	3	Not Used
>Graphic Layer Description	(0070,0068)	3	Not Used

4.3.5.9 MODALITY LUT MODULE

Table 4-16
MODALITY LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality LUT Sequence	(0028,3000)	1C	Copied from the referenced image, if present
>LUT Descriptor	(0028,3002)	1	
>LUT Explanation	(0028,3003)	3	
>Modality LUT Type	(0028,3004)	1	
>LUT Data	(0028,3006)	1	
Rescale Slope	(0028,1052)	1C	Copied from the referenced image, if present
Rescale Intercept	(0028,1053)	1C	Copied from the referenced image, if present
Rescale Type	(0028,1054)	1C	Used

4.3.5.10 SOFTCOPY VOI LUT MODULE

Table 4-17
SOFTCOPY VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Softcopy VOI LUT Sequence	(0028,3110)	1	
>Referenced Image Sequence	(0008,1140)	1C	Used
>>Referenced SOP Class UID	(0008,1150)	1	
>>Referenced SOP Instance UID	(0008,1155)	1	
>>Referenced Frame Number	(0008,1160)	1C	Used if referencing a frame in multi-frame image
>VOI LUT Sequence	(0028,3010)	1C	Used if applied to the referenced image
>>LUT Descriptor	(0028,3002)	1	
>>LUT Explanation	(0028,3003)	3	
>>LUT Data	(0028,3006)	1	
>Window Center	(0028,1050)	1C	A single Value is provided
>Window Width	(0028,1051)	1C	A single Value is provided
>Window Center & Width Explanation	(0028,1055)	3	Not Used
>VOI LUT Function	(0028,1056)	3	Not Used

4.3.5.11 SOFTCOPY PRESENTATION LUT MODULE

Table 4-18
SOFTCOPY PRESENTATION LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Presentation LUT Sequence	(2050,0010)	1C	Not Used
>LUT Descriptor	(0028,3002)	1	
>LUT Explanation	(0028,3003)	3	
>LUT Data	(0028,3006)	1	
Presentation LUT Shape	(2050,0020)	1C	Enumerated Values used: IDENTITY INVERSE

4.3.5.12 SOP COMMON MODULE

Table 4-19
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	
SOP Instance UID	(0008,0018)	1	Generated using the internal computer clock
Specific Character Set	(0008,0005)	1C	Set according to the system configuration. Defined terms shown in Table 2.7-1
Instance Creation Date	(0008,0012)	3	Used
Instance Creation Time	(0008,0013)	3	Used
Instance Creator UID	(0008,0014)	3	Not Used

4.4 PRIVATE DATA ATTRIBUTES

The Product supports the Standard and Private Attributes defined in the following sections in Standard Extended GSPS SOP Instances as Type 3 data elements.

4.4.1 Private Group GEIIS_IW

Private Group GEIIS_IW is modeled as part of the Presentation State Information Entity.

Table 4-20
Private Group GEIIS_IW

Attribute Name	Tag	VR	VM	Use
Private Creator Identification	(0075,00xx)	LO	1	GEIIS_IW
COUNT_IN_SET	(0075,xx02)	IS	1	
GSPS_DISPLAY_ONLY	(0075,xx05)	CS	1	
PRIMITIVE_ID	(0075,xx10)	IS	1	
GLOBAL_SUV_UNIT	(0075,xx11)	SH	1	
STUDY_PART_INFO	(0075,xx15)	LO	1	
STUDY_LAYOUT_DATA	(0075,xx16)	OB	1	
LAYOUT_SEQUENCE	(0075,xx17)	SQ	N	
>GROUP_ID	(0075,xx18)	LO	1	
>LAY_PAGE_FORMAT	(0075,xx19)	IS	2	
>LAY_ACTIVE_PAGE	(0075,xx1A)	IS	1	
PS_OVERLAY_STATE	(0075,xx1B)	LT	1	
DEPENDENT_PS_SEQUENCE	(0075,xx20)	SQ	N	
>DEPENDENT_PS_STUDY_NCD	(0075,xx21)	LO	1	
>DEPENDENT_PS_STUDY_CBP	(0075,xx23)	LO	1	
>DEPENDENT_PS_GSPS_LABEL	(0075,xx24)	LO	1	
>DEPENDENT_PS_DATA_FORMAT	(0075,xx25)	LO	1	
FONT_NAME	(0075,xx60)	ST	1	
FONT_STYLE	(0075,xx61)	IS	1	
FONT_SIZE	(0075,xx62)	IS	1	
FONT_COLOR	(0075,xx63)	IS	1	
GFT_SEQUENCE	(0075,xx69)	SQ	N	
GFT_TYPESTYLEMODE	(0075,xx70)	LT	3	
GFT_GRAFFITY_ID	(0075,xx71)	IS	1	
GFT_SPINE_LABEL	(0075,xx72)	IS	1	
GFT_INTER_VERTEBRAL_SPACE	(0075,xx73)	CS	1	
GFT_SHOW_SPINE_LETTER	(0075,xx74)	CS	1	
GFT_IS_SUV_ROI	(0075,xx75)	CS	1	
GFT_VOI_TYPE	(0075,xx76)	IS	1	
GFT_CALC_TYPE	(0075,xx77)	IS	1	

Attribute Name	Tag	VR	VM	Use
GFT_VOI_SLICE_INDEXES	(0075,xx78)	IS	N	
GFT_IS_PRIMARY_SLICE	(0075,xx79)	CS	1	
GFT_DIAMETER	(0075,xx7A)	DS	1	
GFT_SLICES_NUM	(0075,xx7B)	DS	1	
GFT_WHOLE_SEQUENCE	(0075,xx7C)	CS	1	
GFT_UNITS_TYPE	(0075,xx7D)	IS	1	
GFT_POINTS	(0075,xx7E)	DS	N	
GFT_QPOINTS	(0075,xx7F)	FD	8	
GFT_SPLINE	(0075,xx80)	DS	N	
GFT_TEXT_LOCATION	(0075,xx81)	DS	2	
GFT_AUX_TEXT_LOCATION_1	(0075,xx82)	DS	2	
GFT_AUX_TEXT_LOCATION_2	(0075,xx83)	DS	2	
GFT_COLOR	(0075,xx84)	IS	1	
GFT_COLOR_BW	(0075,xx85)	IS	1	
GFT_TEXT	(0075,xx86)	LT	1	
GFT_AUX_TEXT_1	(0075,xx87)	LT	1	
GFT_AUX_TEXT_2	(0075,xx88)	LT	1	
GFT_FROM_ANCHOR	(0075,xx89)	IS	1	
GFT_TO_ANCHOR	(0075,xx8A)	IS	1	
GFT_SEED_SLICE	(0075,xx8B)	IS	1	
GFT_SEED_POS	(0075,xx8C)	DS	2	
GFT_THRESHOLD	(0075,xx8D)	DS	1	
GFT_VALUES_RANGE	(0075,xx8E)	DS	1	
GFT_NEEDS_RECALC	(0075,xx8F)	CS	1	
GFT_FONT_ALIGN	(0075,xx90)	IS	1	
GFT_FIT_TEXT	(0075,xx91)	CS	1	
COPY_INDEX	(0075,xx92)	IS	1	
GFT_GSPS_RECALC	(0075,xx93)	CS	1	
GRAFFITY_GSPS_COORDS	(0075,xx94)	CS	1	
GRAFFITY_GUID	(0075,xx95)	LO	1	
GFT_OID_PP_PP	(0075,xxA0)	CS	1	
GFT_OID_PP_CELL_ID	(0075,xxA1)	IS	1	
OID_PETCT_PETCT	(0075,xxA5)	CS	1	
OID_PETCT_PLACEHOLER	(0075,xxA6)	ST	1	
OID_PETCT_ROWVECTOR	(0075,xxA7)	DS	3	
OID_PETCT_COLVECTOR	(0075,xxA8)	DS	3	
OID_PETCT_ORIGIN	(0075,xxA9)	DS	3	
OID_PETCT_SLICETHICKNESS	(0075,xxAA)	DS	1	
OID_PETCT_SCALEX	(0075,xxAB)	DS	1	
OID_PETCT_SCALEY	(0075,xxAC)	DS	1	
OID_PETCT_SLICESIZE	(0075,xxAD)	DS	2	
OID_PETCT_SEQID_1	(0075,xxAE)	UI	1	
OID_PETCT_SEQID_2	(0075,xxAF)	UI	1	
PP_CELL_SEQUENCE	(0075,xxB0)	SQ	N	
PP_CELL_SHARPEN	(0075,xxB1)	CS	1	
PP_CELL_CRV	(0075,xxB3)	OB	1	
PP_CELL_OVERLAY_LOCK	(0075,xxB4)	OB	1	
PALETTE	(0075,xxB5)	LT	1	
PALETTE_SEQ	(0075,xxB6)	SQ	N	
PP_CELL_SEQ_COPY_INDEX	(0075,xxB7)	IS	1	
GFT_OID_SEQID	(0075,xxC0)	UI	1	
GFT_OID_IMAGEID	(0075,xxC1)	UI	1	
GFT_OID_COPY_INDEX	(0075,xxC2)	IS	1	
PP_GFT_SEQUENCE	(0075,xxC5)	SQ	N	
PP_CATEGORY	(0075,xxC8)	ST	1	
PP_PAGE_COUNT	(0075,xxC9)	IS	1	
PP_CURRENT_PAGE	(0075,xxCA)	IS	1	
PP_PAGE_BREAKS	(0075,xxCC)	LT	1	

Attribute Name	Tag	VR	VM	Use
PP_FILM_BREAKS	(0075,xxCD)	LT	N	
PP_SCOUT_CELLS	(0075,xxCE)	LT	2	
PP_LAYOUT	(0075,xxCF)	OB	1	
3DA_SEQUENCE	(0075,xxDE)	SQ	N	
3DA_MEAS_SEQUENCE	(0075,xxDF)	SQ	N	
3DA_ID	(0075,xxE0)	IS	1	
3DA_COLOR	(0075,xxE1)	IS	1	
3DA_LABEL	(0075,xxE2)	ST	1	
3DA_LABEL_OFFSET	(0075,xxE3)	DS	2	
3DA_LOCATION	(0075,xxE4)	DS	3	
3DA_IS_ACTIVE	(0075,xxE5)	CS	1	
3DA_MEAS_ENABLED	(0075,xxE6)	CS	1	
3DA_MEAS_DIAMETER	(0075,xxE7)	DS	1	
3DA_MEAS_SHOW	(0075,xxE8)	CS	1	
3DA_ANCHOR_FROM	(0075,xxE9)	IS	1	
3DA_ANCHOR_TO	(0075,xxEA)	IS	1	

4.4.2 Private Group GEIIS_RA1000

Private Group GEIIS_RA1000 is modeled as part of the Presentation State Information Entity.

Table 4-21
Private Group GEIIS_RA1000

Attribute Name	Tag	VR	VM	Use
Private Creator Identification	(0071,00xx)	LO	1	GEIIS_RA1000
Private GSPS Type	(0071,xx10)	CS	1	2 possible values: DISPLAYLIST and NONDISPLAYLIST
Private Font Name	(0071,xx20)	ST	1	Font used for Text Annotation
Private Font Style	(0071,xx21)	US	1	Style code of the font used for Text Annotation
Private Font Size	(0071,xx22)	US	1	Point Size of the font used for Text Annotation
Annotation State View	(0071,xx23)	US	1	Index for an annotation that corresponds to the order it should appear in the statistics view display of the workstation
Private Creator Identification	(0029,00xx)	LO	1C	GEIIS_RA1000 (output when user calibrated pixel spacing or VOI LUT data is saved in GSPS)
User's Name	(0029,xxA1)	ST	1C	Name of user that performed calibration
Date of Calibration	(0029,xxA2)	DA	1C	Date calibration performed
Time of Calibration	(0029,xxA3)	TM	1C	Time calibration performed
Calibration Line	(0029,xxA4)	IS	1C	4 points of calibration line
Original LUT Descriptor	(0029,xx20)	US	3	
Original LUT Explanation	(0029,xx21)	LO	1	
Original LUT Data	(0029,xx22)	US	N	LUT Data before adjustment

4.5 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Universal Viewer does not support any coded terminology using Standard Extended, Private, and Configurable Context Groups.

4.6 IMPORTANT REMARKS

4.6.1 Pixel Spacing Handling

Please refer to the section 2.5.2 “Pixel Spacing Handling” for a detailed description of handling Pixel Spacing.

5. KEY OBJECT SELECTION IOD IMPLEMENTATION

5.1 INTRODUCTION

This section specifies the use of the DICOM Key Object Selection Document IOD to represent results produced by the Universal Viewer implementation. Corresponding attributes are conveyed using the module construct.

Universal Viewer can create Key Object Selection instances explicitly or they may be created automatically when a user selects to export the internal set of key images (print pages). The images that are referenced by the KOS object are selected by placing them into the placeholders of the Print Page template. In addition, a set of GSPS objects are created to reflect the presentation state of each of the images.

Note: The print page template information as well as annotations placed on the page and not on a particular image are not recorded in the KOS object.

The Key Object Selection Document is rendered in the form of Universal Viewer Print Page Key Image Set, where images are displayed in the placeholders of the default Print Page Template.

Universal Viewer supports rendering of instances of the Storage SOP Classes as defined in Table 2-1 referenced in Key Object Selection Document provided the referenced instances are locally stored. If the referenced instances are not locally stored, the application will display an error message in the corresponding placeholder.

5.2 MAPPING OF DICOM ENTITIES

Universal Viewer maps DICOM Information Entities to local information entities in the product's database and user interface.

Table 5-1
Mapping of Dicom Entities to Local Entities

DICOM IE	Local Entity
Patient	Patient
Study	Study
Series	Series
Presentation State	Presentation State

5.3 IOD MODULE TABLE

The Key Object Selection Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 5.4.

Table 5-2
GSPS IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	4.3.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	4.3.2.1
	Patient Study	Not Used	
	Clinical Trial Study	Not Used	
Series	Key Object Document Series	Used	5.4.1.1
	Clinical Trial Series	Not Used	
Equipment	General Equipment	Used	4.3.4.1
Document	Key Object Document	Used	5.4.2.1

Entity Name	Module Name	Usage	Reference
	SR Document Content	Used	5.4.2.2
	SOP Common	Used	4.3.5.12

5.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the Key Object Selection Document Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from when generating the instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

5.4.1 Series Entity Modules

5.4.1.1 KEY OBJECT DOCUMENT SERIES MODULE

Table 5-3
KEY OBJECT DOCUMENT SERIES MODULEATTRIBUTES

Attribute Name	Tag	Type	Use
Modality	(0008,0060)	1	Value = KO
Series Instance UID	(0020,000E)	1	
Series Number	(0020,0011)	1	
Series Date	(0008,0021)	3	Used
Series Time	(0008,0031)	3	Used
Series Description	(0008,103E)	3	Used
Referenced Performed Procedure Step Sequence	(0008,1111)	2	Not Used– Set as empty

5.4.2 Document Entity Modules

5.4.2.1 KEY OBJECT DOCUMENT MODULE

Table 5-4
KEY OBJECT DOCUMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Instance Number	(0020,0013)	1	
Content Date	(0008,0023)	1	
Content Time	(0008,0033)	1	
Referenced Request Sequence	(0040,A370)	1C	
>Study Instance UID	(0020,000D)	1	
>Referenced Study Sequence	(0008,1110)	2	
>>Include 'SOP Instance Reference Macro'			
>Accession Number	(0008,0050)	2	
>Placer Order Number/Imaging Service Request	(0040,2016)	2	
>Filler Order Number/Imaging Service Request	(0040,2017)	2	
>Requested Procedure ID	(0040,1001)	2	
>Requested Procedure Description	(0032,1060)	2	
>Requested Procedure Code Sequence	(0032,1064)	2	
>>Include 'Code Sequence Macro'			
Current Requested Procedure Evidence Sequence	(0040,A375)	1	

Attribute Name	Tag	Type	Use
>Include 'Hierarchical SOP Instance Reference Macro'			
Identical Documents Sequence	(0040,A525)	1C	Not used
>Include 'Hierarchical SOP Instance Reference Macro'			

5.4.2.2 SR DOCUMENT CONTENT MODULE

Table 5-5
SR DOCUMENT CONTENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Observation DateTime	(0040,A032)	1C	
Content Template Sequence	(0040,A504)	1C	
>Mapping Resource	(0008,0105)	1	
>Template Identifier	(0040,DB00)	1	
Value Type	(0040,A040)	1	
Continuity of Content	(0040,A050)	1C	
Concept Name Code Sequence	(0040,A043)	1C	
>Include 'Code Sequence Macro'			
Insert Concept Value attribute(s)			
Content Sequence	(0040,A730)	1C	
> Relationship Type	(0040,A010)	1	
> Referenced Content Item Identifier	(0040,DB73)	1C	Not used
> Insert SR Document Content Module Recursive inclusion to create document content tree.			

See section 5.4.2.2.1 for the list of supported templates

5.4.2.2.1 SR DOCUMENT CONTENT DESCRIPTIONS

5.4.2.2.1.1 CONTENT TEMPLATE

The product supports the following root Templates for SR SOP Instances created, processed, or displayed by the product.

Table 5-6
SR Root Templates

SOP Class	Template ID	Template Name	Use
Key Object Selection Document	2010	Key Object Selection	Create/Display

5.4.2.2.1.2 STANDARD TEMPLATES

Universal Viewer supports the following standard templates for KOS SOP Instances created by this product.

5.4.2.2.1.3 TEMPLATE ID 2010 KEY OBJECT SELECTION

TABLE 5-7
TID 2010 – KEY OBJECT SELECTION TEMPLATE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Usage
1			CONTAINER	CID(7010) Key Object Selection Document Titles	1	M	Used
2	>	HAS CONCEPT MOD	CODE	(113011, DCM, "Document Title Modifier")	1-n	U	Used
3	>	HAS CONCEPT MOD	CODE	(113011, DCM, "Document Title Modifier")	1	UC	Used When Concept Name is (113001, DCM, "Rejected for Quality Reasons") or (113010, DCM," Quality Issue")
4	>	HAS CONCEPT MOD	CODE	(113011, DCM, "Document Title Modifier")	1	MC	Used When Concept Name is (113013, DCM, "Best In Set")
5	>	HAS CONCEPT MOD	INCLUDE	TID(1204) Language of Content Item and Descendants	1	U	Used
6	>	HAS OBS CONTEXT	INCLUDE	TID(1002) Observer Context	1-n	U	Used Only one instance is supported
7	>	CONTAINS	TEXT	(113012, DCM, ”Key Object Description”)	1	U	Used
8	>	CONTAINS	IMAGE	Purpose of Reference shall not be present	1-n	MC	Used
9	>	CONTAINS	WAVEFORM	Purpose of Reference shall not be present	1-n	MC	Not Supported
10	>	CONTAINS	COMPOSITE	Purpose of Reference shall not be present	1-n	MC	Not Supported

TABLE 5-8
TID 1204 – LANGUAGE OF CONTENT ITEM AND DESCENDANTS

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Usage
1		HAS CONCEPT MOD	CODE	(121049,DCM,"Language of Content Item and Descendants")	1	M	Used
2	>	HAS CONCEPT MOD	CODE	(121046,DCM,"Country of Language")	1	U	Not Used

TABLE 5-9
TID 1002 – OBSERVER CONTEXT

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Usage
1		HAS OBS CONTEXT	CODE	(121005,DCM, "Observer Type")	1	MC	Used Observer Type is always (121006,DCM, "Person")
2		HAS OBS CONTEXT	INCLUDE	TID (1003) Person observer identifying attributes	1	MC	Used
3		HAS OBS CONTEXT	INCLUDE	TID (1004) Device observer identifying attributes	1	MC	Not Supported

TABLE 5-10
TID 1003 – PERSON OBSERVER IDENTIFYING ATTRIBUTES

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Usage
1			PNAME	(121008,DCM, "Person Observer Name")	1	M	Used
2			TEXT	(121009,DCM, "Person Observer's Organization Name")	1	U	Not Used
3			CODE	(121010,DCM, "Person Observer's Role in the Organization")	1	U	Not Used
4			CODE	(121011,DCM, "Person Observer's Role in this Procedure")	1	U	Not Used

5.5 PRIVATE DATA ATTRIBUTES

The Product supports the Standard and Private Attributes defined in the following sections in Standard Extended KOS SOP Instances as Type 3 data elements.

5.5.1 Private Group GEIIS_IW

Private Group GEIIS_IW is modeled as part of the SR Document Information Entity.

Table 5-11
Private Group GEIIS_IW

Attribute Name	Tag	VR	VM	Use
Private Creator Identification	(0075,00xx)	LO	1	GEIIS_IW
GFT_OID_PP_PP	(0075,xxA0)	CS	1	
GFT_OID_PP_CELL_ID	(0075,xxA1)	IS	1	
GFT_OID_PETCT_PETCT	(0075,xxA5)	CS	1	
GFT_OID_PETCT_PLACEHOLER	(0075,xxA6)	ST	1	
GFT_OID_PETCT_ROWVECTOR	(0075,xxA7)	DS	3	
GFT_OID_PETCT_COLVECTOR	(0075,xxA8)	DS	3	
GFT_OID_PETCT_ORIGIN	(0075,xxA9)	DS	3	
GFT_OID_PETCT_SLICETHICKNESS	(0075,xxAA)	DS	1	
GFT_OID_PETCT_SCALEX	(0075,xxAB)	DS	1	
GFT_OID_PETCT_SCALEY	(0075,xxAC)	DS	1	
GFT_OID_PETCT_SLICESIZE	(0075,xxAD)	DS	2	
GFT_OID_PETCT_SEQID_1	(0075,xxAE)	UI	1	
GFT_OID_PETCT_SEQID_2	(0075,xxAF)	UI	1	
PP_GFT_SEQUENCE	(0075,xxC5)	SQ	N	
>PP_CATEGORY	(0075,xxC8)	ST	1	
>PP_PAGE_COUNT	(0075,xxC9)	IS	1	
>PP_CURRENT_PAGE	(0075,xxCA)	IS	1	
>PP_PAGE_BREAKS	(0075,xxCC)	LT	1	
>PP_FILM_BREAKS	(0075,xxCD)	LT	N	
>PP_SCOUT_CELLS	(0075,xxCE)	LT	2	
>PP_LAYOUT	(0075,xxCF)	OB	1	
>PP_CELL_SEQUENCE	(0075,xxB0)	SQ	N	
>>PP_CELL_SHARPEN	(0075,xxB1)	CS	1	
>>PP_CELL_CRV	(0075,xxB3)	OB	1	
>>PP_CELL_OVERLAY_LOCK	(0075,xxB4)	OB	1	
>>PALETTE	(0075,xxB5)	LT	1	
>>PALETTE_SEQ	(0075,xxB6)	SQ	N	
>> 3DA_SEQUENCE	(0075,xxDE)	SQ	N	
>>>3DA_MEAS_SEQUENCE	(0075,xxDF)	SQ	N	
>>>>3DA_ID	(0075,xxE0)	IS	1	
>>>>3DA_COLOR	(0075,xxE1)	IS	1	
>>>>3DA_LABEL	(0075,xxE2)	ST	1	
>>>>3DA_LABEL_OFFSET	(0075,xxE3)	DS	2	
>>>>3DA_LOCATION	(0075,xxE4)	DS	3	
>>>>3DA_IS_ACTIVE	(0075,xxE5)	CS	1	
>>>>3DA_MEAS_ENABLED	(0075,xxE6)	CS	1	
>>>>3DA_MEAS_DIAMETER IW_MAKETAG(0x)	(0075,xxE7)	DS	1	
>>>>3DA_MEAS_SHOW	(0075,xxE8)	CS	1	
>>>>3DA_ANCHOR_FROM	(0075,xxE9)	IS	1	
>>>>3DA_ANCHOR_TO	(0075,xxEA)	IS	1	